

REMARKS

Claims 1-5 and 7-22 remain in the application for reconsideration.

Claim 6 has been cancelled in view of the amendments to claim 1. No new matter has been added.

Briefly, the invention is directed to realizing a polarization insensitive planar lightwave circuit (PLC) having reduced birefringence. As shown in Figure 2, one way that has been previously proposed included inserting a rectangular halfwave plate in the PLC. An optical input to the first half of the PLC is converted by the half waveplate before traversing the second half of the PLC. This results in a PLC output that is polarization insensitive. However, as explained on page 2 of the application, due to lack of lateral optical confinement in the half waveplate, the mode profile of the optical signal expands and results in excess loss in the device. To minimize the loss, an extremely thin half waveplate may be used; however, the extent to which thickness may be reduced is limited by fragility, thickness uniformity, and handling difficulties.

As shown in Figures 3-5 of the instant application, embodiments of the present invention involve using a crystal core fiber (CCF) rather than the halfwave plate. The CCF is positioned in a groove between the input and

output sides of the PLC. As discussed on page 4, the CCF acts as a polarization mode converter and rotates by 90 degrees the polarization of the light exiting the PLC with respect to the light entering. Traversing the first half of the PLC with a first polarization and traversing the second half of the PLC with a flipped polarization cancels the polarization sensitivity of the PLC.

Prior Art Rejections:

1. Claim 1 stands rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,082,349 to Cordova-Plaza.
2. Claims 1-5, 7-9, 11-16, and 18-22 stand rejected under § 103 as being unpatentable over U.S. Patent 5,694,496 to Ando in view of U.S. Patents 4,634,215 to Reule and 4,640,615 to Sasaki.
3. Claims 6 and 17 stand rejected under § 103 as being unpatentable over Ando, Reule an Sasaki, further in view of U.S. Patent 5,218,654 to Sauter.
4. Claim 10 stands rejected under § 103 as being unpatentable over Ando, Reule an Sasaki, further in view of U.S. Patent 4,077,699 to Dyott.

These rejections are respectfully traversed based on the following

discussion.

Rejection to claim 1:

Claim 1 stands rejected as being anticipated by Cordova-Plaza. This reference is directed to bi-domain, two-mode single crystal fiber devices. The Examiner has relied in particular on Figure 12 which, as understood, is directed to an optical switch. A crystal fiber 240 is coupled between an input fiber 242 and an output fiber 244. When a voltage is applied to the crystal fiber 240, it couples the input and output fiber between one of two lobes (as shown in Figures 13A-B) and thus acts as an optical switch. This is unrelated to the invention recited in claim 1.

Claim 1 has been amended for clarity and recites “a first portion of a planar waveguide on a substrate; a second portion of the planar waveguide on the substrate; and a segment of crystal core fiber positioned in a groove in the substrate coupling the first portion of the planar waveguide with the second portion of the planar waveguide” (emphasis added).

Since Cordova-Plaza does not teach or suggest a device including a planar waveguide on a substrate, nor the claimed groove, it cannot anticipate or make obvious the present invention. As such, it is respectfully requested that this ground of rejection be withdrawn.

Rejection of Claims 1-5, 7-9, 11-16, and 18-22:

Claims 1-5, 7-9, 11-16, and 18-22 stand rejected under § 103 as being unpatentable over Ando in view of Reule and Sasaki. The primary reference to Ando shows no more relevant material than that which is disclosed in Applicant's background section. That is, as shown in the Examiner's relied upon Figure 12, Ando includes a groove 4 traversing between optical inputs and outputs and includes a halfwave plate 3 positioned therein. This is the very type of device that embodiments of Applicant's invention seek to improve upon. That said, the Examiner has noted that Ando does not teach a crystal core fiber coupling the first portion of a waveguide to a second portion of a waveguide and has therefore further relies on Reule and Sasaki.

Unfortunately, the Examiner has not noted any particular Figure or text section in Reule on which he is relying other than to make a general statement that Reule:

"teaches the use of a rod lens, having a structurally equivalent configuration as an optical fiber with a cylindrical core an cladding , as an input and output means for a planar waveguide".

It is respectfully submitted that Ruele's teaching of a rod lens in a wavelength multiplexer/demultiplexer as an input or output, even if combined with Ando, does not teach or suggest placing a crystal core fiber (CCF) between the input and output of a planar waveguide as is the case with

Applicant's invention.

With regard to the Examiner's reliance on Sasaki, the Examiner merely cites this reference for showing that a rod lens is capable of polarizing light and then reasons that it would have been obvious to use a polarizing rod as taught by the combination of Reule and Sasaki in place of the halfwave plate as taught by Ando. It is respectfully submitted that this stretches the limits of reasonableness.

Referring the Examiner now to MPEP § 2143, titled "Basic Requirements for a Prima Facie case of Obviousness", the MPEP mandates that:

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all of the claimed limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not applicant's disclosure." (emphasis added).

Here, at least the first two criteria for *prima facie* obviousness have not

been met. That is, there is absolutely no teaching or suggestion found in any of Ando, Reule, or Sasaki to combine the various parts in a manner as recited in the claims. Further, there is no reasonable expectation of success that may be gleaned from the references since none even recognize the polarization and birefringence issue addressed by the present invention let alone set forth how this issue may be solved.

Independent claim 1 recites "a segment of crystal core fiber positioned in a groove in the substrate coupling the first portion of the planar waveguide with the second portion of the planar waveguide" (emphasis added). This is not taught or suggested by the combination of Ando, Reule and Sasaki.

Independent claim 11 recites "a V-groove portion of substrate having multiple segments of crystal core fibers inserted into a section of the plurality of waveguides" (emphasis added). Again, this is not taught or suggested by the combination of Ando, Reule and Sasaki.

Independent claim 14 recites "removing a section of the planar lightwave circuit; and inserting a portion of crystal core fiber into the planar lightwave circuit" (emphasis added). Again, this is not taught or suggested by the combination of Ando, Reule and Sasaki.

Finally, Independent claim 19 recites "A method of correcting for birefringence in a planar waveguide, the method comprising...changing a polarization of the optical signal by directing the optical signal through a portion of crystal core fiber" (emphasis added).

It is respectfully submitted that the combination of references set forth by the Examiner do not rise to the level of a showing *prima facie* obviousness as required by the §103. As such it is respectfully requested that this ground of rejection be withdrawn.

Rejection of claim 6 and 17:

With regard to dependent claims 6 and 17, the Examiner has further relied on Saunter in combination with Ando, Reule, and Sasaki for teaching a "V-groove" in a substrate. However, it is respectfully noted that Ando in fact does show a groove (Figure 12, item 4). Thus, Saunter adds absolutely nothing to the combination of references previously discussed and may be considered cumulative. For all the reasons previously stated, the combination of Ando, Reule, and Sasaki, with or without Saunter, fails to make a case for *prima facie* obviousness. As such, it is respectfully requested that this ground of rejection be withdrawn.

Rejection of Claim 10:

The Examiner has rejected claim 10 as being unpatentable over Ando, Reule, and Sasaki as above, further in view of Dyott. In particular, the

Examiner relies on Dyott for teaching a crystal core fiber made out of an organic or polymeric material.

Again, regardless of the particular composition of the fiber, the fact remains that none of Ando, Reule, and Sasaki, with or without Dyott, teach or suggest "a first portion of a planar waveguide on a substrate; a second portion of the planar waveguide on the substrate; and a segment of crystal core fiber positioned in a groove in the substrate coupling the first portion of the planar waveguide with the second portion of the planar waveguide" as recited in independent claim 1.

Further, claim 10 depends from claim 7 which recites "the segment of crystal core fiber has a length that satisfies the equation $(2m+1) * \lambda / (2 * \Delta n)$ " (emphasis added), which is also not taught or suggested by the cited references. Thus, it is respectfully requested that this ground of rejection be withdrawn.

Conclusion

What the Examiner has done is attempted to construct the claimed invention from the referenced patents with no independent teaching for the construction he proposes. Applicant has solved a fundamental polarization/birefringence issue for planar lightwave circuits. Applicant's invention is simply not suggested by the prior art and, therefore, applicant is

entitled to protection sought by the rejected claims.

In view of the foregoing, it is respectfully requested that the application be reconsidered, that claims 1-5 and 7-22 be allowed and that the application be passed to issue. Please charge any shortages and credit any overcharges to our Deposit Account number 02-2666.

Respectfully submitted,

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